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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

RIN 0648-XE451

Takes of Marine Mammals Incidental to Specified Activities; Marine Geophysical Survey in the Southeast Pacific Ocean, 2016-2017

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Department of Commerce.

ACTION: Notice; Issuance of an Incidental Harassment Authorization.

SUMMARY: In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is hereby given that NMFS has issued an incidental harassment authorization (IHA) to Lamont-Doherty Earth Observatory (Lamont-Doherty) in collaboration with the National Science Foundation (NSF), to incidentally take, by level B harassment, 44 species of marine mammals, and to incidentally take, by Level A harassment, 26 species of marine mammals, during three marine geophysical (seismic) surveys in the southeast Pacific Ocean.

DATES: This Authorization is effective from August 1, 2016, through July 31, 2017.

FOR FURTHER INFORMATION CONTACT: Jordan Carduner, NMFS, Office of Protected Resources, NMFS (301) 427-8401.

SUPPLEMMENTARY INFORMATION:

Background

Section 101(a)(5)(D) of the Marine Mammal Protection Act of 1972, as amended (MMPA; 16 U.S.C. 1361 *et seq.*) directs the Secretary of Commerce to allow, upon request, the

incidental, but not intentional, taking of small numbers of marine mammals of a species or population stock, by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if, after NMFS provides a notice of a proposed authorization to the public for review and comment: (1) NMFS makes certain findings; and (2) the taking is limited to harassment.

An Authorization shall be granted for the incidental taking of small numbers of marine mammals if NMFS finds that the taking will have a negligible impact on the species or stock(s), and will not have an unmitigable adverse impact on the availability of the species or stock(s) for subsistence uses (where relevant). The Authorization must also set forth the permissible methods of taking; other means of effecting the least practicable adverse impact on the species or stock and its habitat (*i.e.*, mitigation); and requirements pertaining to the monitoring and reporting of such taking. NMFS has defined "negligible impact" in 50 CFR 216.103 as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival."

Except with respect to certain activities not pertinent here, the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Summary of Request

On January 19, 2016, NMFS received an application from Lamont-Doherty requesting that NMFS issue an Authorization for the take of marine mammals, incidental to Oregon State

University (OSU) and University of Texas (UT) conducting seismic surveys in the southeast Pacific Ocean, in the latter half of 2016 and/or the first half of 2017. NMFS considered the application and supporting materials adequate and complete on March 21, 2016.

Lamont-Doherty plans to conduct three two-dimensional (2-D) surveys on the R/V *Marcus G. Langseth* (*Langseth*), a vessel owned by NSF and operated on its behalf by Columbia University's Lamont-Doherty Earth Observatory primarily in international waters of the southeast Pacific Ocean, with a small portion of the surveys occurring within the territorial waters of Chile, which extend to nautical 12 miles (mi) (19.3 kilometers (km)) from the coast. NMFS cannot authorize the incidental take of marine mammals in the territorial seas of foreign nations, as the MMPA does not apply in those waters. However, as part of the analysis supporting our determination under the MMPA that the activity would have a negligible impact on the affected species, we must consider the level of incidental take as a result of the activity in the entire activity area (including both territorial seas and high seas).

Increased underwater sound generated during the operation of the seismic airgun array is the only aspect of the activity that is likely to result in the take of marine mammals. We anticipate that take, by Level B harassment, of 44 species of marine mammals could result from the specified activity. Although unlikely, NMFS also anticipates that a small amount of take by Level A harassment of 26 species of marine mammals could occur during the planned surveys.

Description of the Specified Activity

Lamont-Doherty plans to use one source vessel, the *Langseth*, with an array of 36 airguns as the energy source with a total volume of approximately 6,600 cubic inches (in^3). The receiving system would consist of up to 64 ocean bottom seismometers and a single hydrophone streamer between 8 and 15 km (4.9 and 9.3 mi) in length. In addition to the operations of the

airgun array, a multibeam echosounder (MBES) and a sub-bottom profiler (SBP) would also be operated continuously throughout the proposed surveys. A total of approximately 9,633 km (5,986 mi) of transect lines would be surveyed in the southeast Pacific Ocean.

A detailed description of Lamont-Doherty's planned seismic surveys is provided in the **Federal Register** notice for the proposed IHA (81 FR 23117; April 19, 2016). Since that time, no changes have been made to the planned activities. Therefore, a detailed description is not provided here. Please refer to that **Federal Register** notice for the description of the specific activity.

Comments and Responses

NMFS published a notice of receipt of Lamont-Doherty's application and proposed Authorization in the **Federal Register** on April 19, 2016 (81 FR 23117). During the 30-day public comment period, NMFS received comment letters from the Marine Mammal Commission (Commission) and from the Marcus Langseth Science Oversight Committee, as well as one comment from a member of the general public. NMFS has posted the comments online at: *http://www.nmfs.noaa.gov/pr/permits/incidental*.

NMFS addresses any comments specific to Lamont-Doherty's application related to the statutory and regulatory requirements or findings that NMFS must make under the MMPA in order to issue an Authorization. The following is a summary of the public comments and NMFS's responses.

Modeling Exclusion and Buffer Zones

Comment 1: The Commission expressed concerns regarding Lamont-Doherty's method to estimate exclusion and buffer zones. The Commission stated that the model is not the best available science because it assumes the following: spherical spreading, constant sound speed,

and no bottom interactions for surveys in deep water. In light of their concerns, the Commission recommended that NMFS require Lamont-Doherty to re-estimate the exclusion and buffer zones incorporating site-specific environmental (including sound speed profiles, bathymetry, and sediment characteristics) and operational (including number/type/spacing of airguns, tow depth, source level/operating pressure, and operational volume) parameters into their model.

Response: NMFS acknowledges the Commission's concerns about Lamont-Doherty's current modeling approach for estimating exclusion and buffer zones and also acknowledges that Lamont-Doherty did not incorporate site-specific sound speed profiles, bathymetry, and sediment characteristics of the research area in the current approach to estimate those zones for this planned seismic survey.

Lamont-Doherty's application (LGL, 2016) and the NSF's draft environmental analysis (NSF, 2016) describe the approach to establishing mitigation exclusion and buffer zones. In summary, Lamont-Doherty acquired field measurements for several array configurations at shallow, intermediate, and deep-water depths during acoustic verification studies conducted in the northern Gulf of Mexico in 2007 and 2008 (Tolstoy *et al*., 2009). Based on the empirical data from those studies, Lamont-Doherty developed a sound propagation modeling approach that predicts received sound levels as a function of distance from a particular airgun array configuration in deep water. For this survey, Lamont-Doherty developed the exclusion and buffer zones for the airgun array based on the empirically-derived measurements from the Gulf of Mexico calibration survey (Appendix H of NSF's 2011 PEIS). For deep water (>1000 m), Lamont-Doherty used the deep-water radii obtained from model results down to a maximum water depth of 2000 m (Figure 2 and 3 in Appendix H of NSF's 2011 PEIS; the radii for intermediate water depths (100–1000 m) were derived from the deep-water ones by applying a

correction factor (multiplication) of 1.5, such that observed levels at very near offsets fall below the corrected mitigation curve (Fig. 16 in Appendix H of the NSF's 2011 PEIS); the shallow-water radii were obtained by scaling the empirically derived measurements from the Gulf of Mexico calibration survey to account for the differences in tow depth between the calibration survey (6 m) and the proposed surveys (9 and 12 m).

In 2015, Lamont-Doherty explored the question of whether the Gulf of Mexico calibration data adequately informs the model to predict exclusion isopleths in other areas by conducting a retrospective sound power analysis of one of the lines acquired during Lamont-Doherty's seismic survey offshore New Jersey in 2014 (Crone, 2015). NMFS presented a comparison of the predicted radii (*i.e.*, modeled exclusion zones) with radii based on in situ measurements (*i.e.*, the upper bound [95th percentile] of the cross-line prediction) in a previous notice of issued Authorization for Lamont-Doherty (see Table 1, 80 FR 27635, May 14, 2015).

Briefly, Crone's (2015) analysis, specific to the survey site offshore New Jersey, confirmed that in-situ, site specific measurements and estimates of the 160- and 180-dB isopleths collected by the *Langseth's* hydrophone streamer in shallow water were smaller than the modeled (*i.e.*, predicted) exclusion and buffer zones proposed for use in two seismic surveys conducted offshore New Jersey in shallow water in 2014 and 2015. In that particular case, Crone's (2015) results showed that Lamont-Doherty's modeled exclusion (180-dB) and buffer (160-dB) zones were approximately 28 and 33 percent smaller, respectively, than the in situ, site-specific measurements, thus confirming that Lamont-Doherty's model was conservative in that case, as emphasized by Lamont-Doherty in its application and in supporting environmental documentation. The following is a summary of two additional analyses of in-situ data that support Lamont-Doherty's use of the modeled exclusion and buffer zones in this particular case.

In 2010, Lamont-Doherty assessed the accuracy of their modeling approach by comparing the sound levels of the field measurements acquired in the Gulf of Mexico study to their model predictions (Diebold *et al*., 2010). They reported that the observed sound levels from the field measurements fell almost entirely below the predicted mitigation radii curve for deep water (greater than 1,000 m; 3280.8 ft) (Diebold *et al*., 2010).

In 2012, Lamont-Doherty used a similar process to model exclusion and buffer zones for a shallow-water seismic survey in the northeast Pacific Ocean offshore Washington State in 2012. Lamont-Doherty conducted the shallow-water survey using the same airgun configuration planned for this seismic survey (*i.e*., 6,600 in^3) and recorded the received sound levels on both the shelf and slope off Washington State using the *Langseth's* 8 km hydrophone streamer. Crone *et al*. (2014) analyzed those received sound levels from the 2012 survey and confirmed that in-situ, site specific measurements and estimates of the 160-dB and 180-dB isopleths collected by the *Langseth's* hydrophone streamer in shallow water were two to three times smaller than Lamont-Doherty's modeling approach had predicted. While the results confirmed bathymetry's role in sound propagation, Crone *et al*. (2014) were able to confirm that the empirical measurements from the Gulf of Mexico calibration survey (the same measurements used to inform Lamont-Doherty's modeling approach for the planned seismic survey in the southeast Pacific Ocean) overestimated the size of the exclusion and buffer zones for the shallow-water 2012 survey off Washington State and were thus precautionary, in that particular case.

The model Lamont-Doherty currently uses does not allow for the consideration of environmental and site-specific parameters as requested by the Commission. NMFS continues to work with Lamont-Doherty and the NSF to address the issue of incorporating site-specific information to further inform the analysis and development of mitigation measures in oceanic

and coastal areas for future seismic surveys with Lamont-Doherty. However, Lamont-Doherty's current modeling approach (supported by the three data points discussed previously) represents the best available information for NMFS to reach determinations for the Authorization. As described earlier, the comparisons of Lamont-Doherty's model results and the field data collected in the Gulf of Mexico, offshore Washington State, and offshore New Jersey illustrate a degree of conservativeness built into Lamont-Doherty's model for deep water, which NMFS expects to offset some of the limitations of the model to capture the variability resulting from site-specific factors. Based upon the best available information (*i.e.*, the three data points, two of which are peer-reviewed, discussed in this response), NMFS finds that the exclusion and buffer zone calculations are appropriate for use in this particular survey.

Lamont-Doherty has conveyed to NMFS that additional modeling efforts to refine the process and conduct comparative analysis may be possible with the availability of research funds and other resources. Obtaining research funds is typically accomplished through a competitive process, including those submitted to U.S. Federal agencies. The use of models for calculating buffer and exclusion zone radii and for developing take estimates is not a requirement of the MMPA incidental take authorization process. Furthermore, NMFS does not provide specific guidance on model parameters nor prescribe a specific model for applicants as part of the MMPA incidental take authorization process at this time. There is a level of variability not only with parameters in the models, but also the uncertainty associated with data used in models, and therefore, the quality of the model results submitted by applicants. NMFS considers this variability when evaluating applications and the take estimates and mitigation measures that the model informs. NMFS takes into consideration the model used, and its results, in determining the potential impacts to marine mammals; however, it is just one component of the analysis during

the MMPA authorization process as NMFS also takes into consideration other factors associated with the activity (*e.g*., geographic location, duration of activities, context, sound source intensity, etc.).

Uncertainty in Density Estimates

Comment 2: The Commission expressed concern regarding uncertainty in the representativeness of the marine mammal density data and the assumptions used to calculate estimated takes. The Commission recommended that NMFS adjust density estimates using some measure of uncertainty when available density data originate from different geographic areas, temporal scales, and seasons, especially for actions which will occur outside the U.S. Exclusive Economic Zone (EEZ) where site- and species-specific density estimates tend to be scant, such as Lamont-Doherty's planned survey.

Response: NMFS believes that, in the absence of site-specific marine mammal density data in the region of Lamont-Doherty's planned survey, the best available information was used to estimate marine mammal density data for the project area and to calculate estimated takes. However, NMFS acknowledges that the lack of site- and species-specific density data for certain geographic areas presents inherent challenges in estimating takes, and agrees with the Commission's recommendation that a systematic approach to incorporating uncertainty in density estimates when available density data originate from different geographic areas, temporal scales, and seasons is warranted. NMFS is actively working to develop a systematic process for the use of density estimates in authorizations when uncertainties in density data exist as a result of geographic differences, temporal differences, or accuracy of data, and to encourage applicants for incidental take authorization to utilize this process when it is complete. NMFS looks forward to developing this process in collaboration with the Commission.

Monitoring and Reporting

Comment 3: The Commission indicated that monitoring and reporting requirements should provide a reasonably accurate assessment of the types of taking and the numbers of animals taken by the proposed activity. They recommend that NMFS and Lamont-Doherty incorporate an accounting for animals at the surface but not detected [*i.e.*, g(0) values] and for animals present but underwater and not available for sighting [*i.e.*, f(0) values] into monitoring efforts. In light of the Commission's previous comments, they recommend that NMFS consult with the funding agency (*i.e.*, the NSF) and individual applicants (*e.g.*, Lamont-Doherty and other related entities) to develop, validate, and implement a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken, accounting for applicable g(0) and f(0) values, based in part on monitoring data collected during geophysical surveys.

Response: NMFS agrees with the Commission's recommendation to improve the post-survey reporting requirements for NSF and Lamont-Doherty by accounting for takes using applicable g(0) and f(0) values. In December 2015, NMFS met with Commission representatives to discuss ways to develop and validate a monitoring program that provides a scientifically sound, reasonably accurate assessment of the types of marine mammal takes and the actual numbers of marine mammals taken. In July 2016, NMFS solicited input from the Commission regarding methodology for determining applicable g(0) and f(0) values. Based on this input, NMFS has included a requirement in the issued IHA that Lamont-Doherty must provide an estimate of the number (by species) of marine mammals that may have been exposed (based on modeling results and accounting for animals at the surface but not detected [i.e., g(0) values] and for animals present but underwater and not available for sighting [i.e., f(0) values]) to the seismic

activity at received levels greater than or equal to 160 dB re: 1 μPa and/or 180 dB re 1 μPa for cetaceans and 190-dB re 1 μPa for pinnipeds. NMFS will provide the methodology for determining the applicable f(0) and g(0) values to Lamont-Doherty.

The comment letter from the Marcus Langseth Science Oversight Committee affirmed that there is significant support from the Committee for the IHA to be issued for the proposed activity and for the survey to be conducted. NMFS received one additional comment from a private citizen that expressed concern that the project would result in the deaths of marine mammals and that the application should be denied on the grounds that it would cost taxpayers too much money; NMFS considered this comment, however, no deaths of marine mammals are anticipated as a result of the project as described below, and NMFS does not have the ability to deny applications for authorization to incidentally take marine mammals based on an applicant's funding sources.

Description of Marine Mammals in the Area of the Specified Activity

Table 1 in this notice provides the following: all marine mammal species with possible or confirmed occurrence in the planned activity area; information on those species' regulatory status under the MMPA and the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq*.); abundance; local occurrence and range; and seasonality in the planned activity area. Based on the best available information, NMFS expects that there may be a potential for certain cetacean and pinniped species to occur within the survey area (*i.e*., potentially be taken) and have included additional information for these species in Table 1 of this notice. NMFS will carry forward analyses on the species listed in Table 1 later in this document.

Table 1 - General information on marine mammals that could potentially occur in the three planned survey areas within the southeast Pacific Ocean.

Species	Regulatory Status[1, 2]	Species Abundance[3]	Local Occurrence	Habitat
Antarctic minke whale (*Balaenoptera bonaerensis*)	MMPA - NC ESA – NL	515,000	North – Rare Central/South – Uncommon	Coastal, pelagic
Blue whale (*B. musculus*)	MMPA - D ESA – EN	10,000[4]	North – Common Central/South – Common	Coastal, shelf, pelagic
Bryde's whale (*Balaenoptera edeni*)	MMPA - NC ESA – NL	43,633[5]	North – Common Central/South – Common	Coastal, pelagic
Common minke whale (*B. acutorostrata*)	MMPA - NC ESA – NL	515,000	North – Rare Central/South – Uncommon	Coastal, pelagic
Fin whale (*B. physalus*)	MMPA - D ESA – EN	22,000	North – Rare Central/South – Common	Shelf, slope, pelagic
Humpback whale (*Megaptera novaengliae*)	MMPA - D ESA – EN	42,000	North – Common Central/South – Common	Coastal, shelf, pelagic
Pygmy right whale (*Caperea marginata*)	MMPA - NC ESA – NL	Unknown	North – Unknown Central/South – Rare	Coastal, oceanic
Sei whale (*B. borealis*)	MMPA - D ESA – EN	10,000	North – Uncommon Central/South – Uncommon	Pelagic
Southern right whale (*Eubalaena australis*)	MMPA - D ESA – EN	12,000	North – Rare Central/South – Rare	Coastal, oceanic
Sperm whale (*Physeter macrocephalus*)	MMPA - D ESA – EN	355,000[6]	North – Common Central/South – Common	Pelagic, deep seas
Dwarf sperm whale (*Kogia sima*)	MMPA - NC ESA – NL	170,309[7]	North – Rare Central/South – Rare	Shelf, pelagic
Pygmy sperm whale (*K. breviceps*)	MMPA - NC ESA – NL	170,309[7]	North – Rare Central/South – Rare	Shelf, pelagic
Andrew's beaked whale (*Mesoplodon bowdoini*)	MMPA - NC ESA – NL	25,300[8]	North – Unknown Central/South – Rare	Pelagic
Blainville's beaked	MMPA -	25,300[8]	North – Uncommon	Pelagic

whale (*M.densirostris*)	NC ESA – NL		Central/South – Uncommon	
Cuvier's beaked whale (*Ziphius cavirostris*)	MMPA - NC ESA – NL	20,000[8]	North – Uncommon Central/South – Uncommon	Slope, pelagic
Gray's beaked whale (*M. grayi*)	MMPA - NC ESA – NL	25,300[8]	North – Rare Central/South – Rare	Pelagic
Hector's beaked whale (*M. hectori*)	MMPA - NC ESA – NL	25,300[8]	North – Unknown Central/South – Rare	Pelagic
Pygmy beaked whale (*Mesoplodon peruvianus*)	MMPA - NC ESA – NL	25,300[8]	North – Rare Central/South – Rare	Pelagic
Shepherd's beaked whale (*Tasmacetus shepherdi*)	MMPA - NC ESA – NL	25,300[8]	North – Unknown Central/South – Rare	Pelagic
Spade-toothed whale (*Mesoplodon traversii*)	MMPA - NC ESA – NL	25,300[8]	North – Unknown Central/South – Rare	Pelagic
Strap-toothed beaked whale (*M. layardii*)	MMPA - NC ESA – NL	25,300[8]	North – Unknown Central/South – Rare	Pelagic
Southern bottlenose whale (*Hyperoodon planifrons*)	MMPA - NC ESA – NL	72,000[9]	North – Unknown Central/South – Uncommon	Pelagic
Chilean dolphin (*Cephalorhynchus eutropia*)	MMPA - NC ESA – NL	10,000	North – Unknown Central/South – Uncommon	Coastal
Rough-toothed dolphin (*Steno bredanensis*)	MMPA - NC ESA – NL	107,633[10]	North – Rare Central/South – Unknown	Oceanic
Common bottlenose dolphin (*Tursiops truncatus*)	MMPA - NC ESA – NL	335,834[10]	North – Abundant Central/South – Common	Coastal, pelagic, shelf
Striped dolphin (*S. coeruleoalba*)	MMPA - NC ESA – NL	964,362[10]	North – Abundant Central/South – Common	Shelf edge, pelagic
Short-beaked common dolphin (*Delphinus delphis*)	MMPA - NC ESA – NL	1,766,551[11]	North – Abundant Central/South – Abundant	Coastal, shelf
Long-beaked common dolphin (*Delphinus capensis*)	MMPA - NC ESA – NL	144,000[12]	North – Uncommon Central/South – Unknown	Coastal, shelf

Dusky dolphin (*Lagenorhynchus obscurus*)	MMPA - NC ESA – NL	25,880[13]	North – Abundant Central/South – Abundant	Shelf, slope
Peale's dolphin (*Lagenorhynchus australis*)	MMPA - NC ESA – NL	Unknown	North – Unknown Central/South – Uncommon	Coastal
Hourglass dolphin (*Lagenorhynchus cruciger*)	MMPA - NC ESA – NL	144,300[14]	North – Unknown Central/South – Rare	Pelagic
Southern right whale dolphin (*Lissodelphis peronii*)	MMPA - NC ESA – NL	Unknown	North – Uncommon Central/South – Common	Pelagic
Risso's dolphin (*Grampus griseus*)	MMPA - NC ESA – NL	110,457[10]	North – Common Central/South – Uncommon	Shelf, slope
Pygmy killer whale (*Feresa attenuate*)	MMPA - NC ESA – NL	38,900[8]	North – Rare Central/South – Uncommon	Oceanic, pantropical
False killer whale (*Pseudorca crassidens*)	MMPA - NC ESA – NL	39,800[8]	North – Uncommon Central/South – Rare	Pelagic
Killer whale (*Orcinus orca*)	MMPA - NC ESA – NL	50,000	North – Rare Central/South – Rare	Coastal, shelf, pelagic
Long-finned pilot whale (*Globicephala melas*)	MMPA - NC ESA – NL	200,000[15]	North – Rare Central/South – Rare	Coastal, pelagic
Short-finned pilot whale (*Globicephala macrorhynchus*)	MMPA - NC ESA – NL	589,315[16]	North – Rare Central/South – Rare	Coastal, pelagic
Burmeister's porpoise (P*hocoena spinipinnis*)	MMPA - NC ESA – NL	Unknown	North – Coastal Central/South – Coastal	Coastal
Juan Fernandez fur seal (*Arctocephalus philippii*)	MMPA - NC ESA – NL	32,278[17]	North – Rare Central/South – Rare	Coastal, pelagic
South American fur seal (*Arctocephalus australis*)	MMPA - NC ESA – NL	250,000	North – Rare Central/South – Rare	Coastal, shelf, slope
South American sea lion (*Otaria byronia*)	MMPA - NC ESA – NL	397,771[18]	North – Abundant Central/South – Abundant	Coastal, shelf
Southern elephant seal	MMPA -	640,000[19]	North – Abundant	Coastal,

(*Mirounga leonina*)	NC ESA – NL		Central/South – Abundant	pelagic

[1] MMPA: NC= Not classified; D= Depleted;
[2] ESA: EN = Endangered, T = Threatened, DL = Delisted, NL = Not listed.
[3] Except where noted best estimate abundance information obtained from the International Whaling Commission's whale population estimates (IWC, 2016) or from the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species website (IUCN, 2016). Unknown = Abundance information does not exist for this species.
[4] IUCN's best estimate of the global population is 10,000 to 25,000.
[5] Estimate from IUCN's webpage for Bryde's whales. Southern Hemisphere: southern Indian Ocean (13,854); western South Pacific (16,585); and eastern South Pacific (13,194) (IWC, 1981).
[6] Whitehead (2002).
7 Estimate from IUCN's webpage for *Kogia* spp. Eastern Tropical Pacific (ETP) (150,000); Hawaii (19,172); Gulf of Mexico (742); and western Atlantic (395).
[8] Wade and Gerrodette (1993).
[9] South of 60°S from the 1885/1986–1990/1991 IWC/IDCR and SOWER surveys (Branch and Butterworth, 2001).
[10] ETP, line-transect survey, August-December 2006 (Gerrodette *et al*., 2008).
[11] ETP, southern stock, 2000 survey (Gerrodette and Forcada 2002).
[12] Gerrodette and Palacios (1996) estimated 55,000 within Pacific coast waters of Mexico, 69,000 in the Gulf of California, and 20,000 off South Africa. IUCN, 2016.
[13] IUCN, 2016 and Markowitz, 2004.
[14] Kasamatsu and Joyce, 1995.
[15] Abundance estimates for beaked, southern bottlenose, and pilot whales south of the Antarctic Convergence in January (Kasamatsu and Joyce, 1995).
[16] Gerrodette and Forcada (2002).
[17] 2005/2006 minimum population estimate (Osman, 2008).
[18] Crespo *et al*. (2012). Current status of the South American sea lion along the distribution range.
[19] Hindell and Perrin (2009).

NMFS refers the public to Lamont-Doherty's application and NSF's environmental analysis (available online at: *http://www.nmfs.noaa.gov/pr/sars/species.htm*) for further information on the biology and local distribution of these species. Please also refer to NMFS's website (*http://www.nmfs.noaa.gov/pr/permits/incidental/*) for generalized species accounts.

Potential Effects of the Specified Activities on Marine Mammals

Operating active acoustic sources, such as airgun arrays, has the potential for adverse effects on marine mammals. The **Federal Register** notice for the proposed IHA (81 FR 23117;

April 19, 2016) provided a discussion of the effects of anthropogenic noise on marine mammals as well as a detailed description of the potential effects of Lamont-Doherty's activities on marine mammals. Therefore that information is not repeated here; please refer to the **Federal Register** notice for the proposed IHA (81 FR 23117; April 19, 2016) for that information. During 10 nm of transit that may occur between surveys (described in the **Federal Register** notice for the proposed IHA (81 FR 23117; April 19, 2016)) the operation of the MBES and SBP may occur independent of airgun operation. The operation of the MBES and SBP in the absence of airgun use was not explicitly described in the **Federal Register** notice for the proposed IHA (81 FR 23117; April 19, 2016); though it comprises a very small portion of the total anticipated effects of this action, it has now been included for consideration in the analyses. The "Estimated Take by Incidental Harassment" section later in this document will include a quantitative analysis of the number of individuals that NMFS expects to be taken by this activity. The "Negligible Impact Analysis" section will include the analysis of how this specific activity would impact marine mammals and will consider the content of this section, the "Estimated Take by Incidental Harassment" section, the "Mitigation Measures" section, and the "Anticipated Effects on Marine Mammal Habitat" section to draw conclusions regarding the likely impacts of this activity on the reproductive success or survivorship of individuals and from that on the affected marine mammal populations or stocks.

Anticipated Effects on Marine Mammal Habitat

The primary potential impacts to marine mammal habitat and other marine species from Lamont-Doherty's planned activities are associated with elevated sound levels produced by airguns. The impacts of Lamont-Doherty's planned activities on fish and other marine life specifically related to acoustic activities are expected to be temporary in nature, negligible, and

would not result in substantial impact to these species or to their role in the ecosystem. NMFS does not anticipate that the planned activity would have any habitat-related effects that could cause significant or long-term consequences for individual marine mammals or their populations. The potential effects of Lamont-Doherty's planned activities on marine mammal habitat and other marine species are discussed in detail in the **Federal Register** notice for the proposed IHA (81 FR 23117; April 19, 2016), therefore that information is not repeated here; please refer to that **Federal Register** notice for that information.

Mitigation Measures

In order to issue an Incidental Harassment Authorization under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to such activity, and other means of effecting the least practicable adverse impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for certain subsistence uses (where relevant).

Lamont-Doherty has reviewed the following source documents and has incorporated a suite of mitigation measures into their project description:

(1) Protocols used during previous Lamont-Doherty and NSF-funded seismic research cruises as approved by us and detailed in the NSF's 2011 PEIS and 2016 draft environmental analysis;

(2) Previous IHA applications and authorizations that NMFS has approved and authorized; and

(3) Recommended best practices in Richardson *et al.* (1995), Pierson *et al.* (1998), and Weir and Dolman (2007).

To reduce the potential for disturbance from acoustic stimuli associated with the activities, Lamont-Doherty, and/or its designees plan to implement the following mitigation measures for marine mammals:

(1) Vessel-based visual mitigation monitoring;

(2) Exclusion zones;

(3) Power down procedures;

(4) Shutdown procedures;

(5) Ramp-up procedures; and

(6) Speed and course alterations.

NMFS reviewed Lamont-Doherty's mitigation measures and developed the following additional mitigation measures to effect the least practicable adverse impact on marine mammals:

(1) Expanded power down procedures for concentrations of six or more whales that do not appear to be traveling (*e.g.*, feeding, socializing, etc.).

Vessel-based Visual Mitigation Monitoring

Lamont-Doherty would position observers aboard the seismic source vessel to watch for marine mammals near the vessel during daytime airgun operations and during any start-ups at night. Observers would also watch for marine mammals near the seismic vessel for at least 30 minutes prior to the start of airgun operations after an extended shutdown (*i.e.*, greater than approximately eight minutes for this planned cruise). When feasible, the observers would conduct observations during daytime periods when the seismic system is not operating for comparison of sighting rates and behavior with and without airgun operations and between acquisition periods. Based on the observations, the *Langseth* would power down or shutdown the

airguns when marine mammals are observed within or about to enter a designated exclusion zone for cetaceans or pinnipeds.

During seismic operations, at least four protected species observers would be aboard the *Langseth*. Lamont-Doherty would appoint the observers with NMFS's concurrence, and they would conduct observations during ongoing daytime operations and nighttime ramp-ups of the airgun array. During the majority of seismic operations, two observers would be on duty from the observation tower to monitor marine mammals near the seismic vessel. Using two observers would increase the effectiveness of detecting animals near the source vessel. However, during mealtimes and bathroom breaks, it is sometimes difficult to have two observers on effort, but at least one observer would be on watch during bathroom breaks and mealtimes. Observers would be on duty in shifts of no longer than four hours in duration.

Two observers on the *Langseth* would also be on visual watch during all nighttime ramp-ups of the seismic airguns. A third observer would monitor the passive acoustic monitoring equipment 24 hours a day to detect vocalizing marine mammals present in the action area. In summary, a typical daytime cruise would have scheduled two observers (visual) on duty from the observation tower, and an observer (acoustic) on the passive acoustic monitoring system. Before the start of the seismic survey, Lamont-Doherty would instruct the vessel's crew to assist in detecting marine mammals and implementing mitigation requirements.

The *Langseth* is a suitable platform for marine mammal observations. When stationed on the observation platform, the eye level would be approximately 21.5 m (70.5 ft) above sea level, and the observer would have a good view around the entire vessel. During daytime, the observers would scan the area around the vessel systematically with reticle binoculars (*e.g.*, 7 x 50 Fujinon), Big-eye binoculars (25 x 150), and with the naked eye. During darkness, night vision

devices would be available (ITT F500 Series Generation 3 binocular-image intensifier or equivalent), when required. Laser range-finding binoculars (Leica LRF 1200 laser rangefinder or equivalent) would be available to assist with distance estimation. They are useful in training observers to estimate distances visually, but are generally not useful in measuring distances to animals directly. The user measures distances to animals with the reticles in the binoculars.

Lamont-Doherty would immediately power down or shutdown the airguns when observers see marine mammals within or about to enter the designated exclusion zone. The observer(s) would continue to maintain watch to determine when the animal(s) are outside the exclusion zone by visual confirmation. Airgun operations would not resume until the observer has confirmed that the animal has left the zone, or if not observed after 15 minutes for species with shorter dive durations (small odontocetes and pinnipeds) or 30 minutes for species with longer dive durations (mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, killer, and beaked whales).

Mitigation Exclusion Zones

Lamont-Doherty would use safety radii to designate exclusion zones and to estimate take for marine mammals. Table 2 shows the distances at which one would expect to receive sound levels (160-, 180-, and 190-dB,) from the airgun array and a single airgun. If the protected species visual observer detects marine mammal(s) within or about to enter the appropriate exclusion zone, the *Langseth* crew would immediately power down the airgun array, or perform a shutdown if necessary (see Shutdown Procedures).

Table 2 - Predicted distances to which sound levels greater than or equal to 160 re: 1 µPa could be received during the planned survey areas within the southeast Pacific Ocean.

Source and Volume (in^3)	Tow Depth (m)	Water Depth (m)	Predicted RMS Distances[1] (m)		
			190 dB	180 dB	160 dB
Single Bolt airgun (40 in^3)	9 or 12	< 100	100[2]	100[2]	1,041
		100 to 1,000	100	100	647
		> 1,000	100	100	431
36-Airgun Array (6,600 in^3)	9	< 100	591	2,060	22,580
		100 to 1,000	429	1,391	8,670
		> 1,000	286	927	5,780
36-Airgun Array (6,600 in^3)	12	< 100	710	2,480	27,130
		100 to 1,000	522	1,674	10,362
		> 1,000	348	1,116	6,908

[1] Predicted distances based on information presented in Lamont-Doherty's application.
[2] NMFS required Lamont-Doherty to expand the exclusion zone for the mitigation airgun to 100 m (328 ft) in shallow water.

The 180- or 190-dB level shutdown criteria are applicable to cetaceans and pinnipeds, respectively, as specified by NMFS (2000). Lamont-Doherty used these levels to establish the exclusion zones as presented in their application.

Lamont-Doherty used a process to develop and confirm the conservativeness of the mitigation radii for a shallow-water seismic survey in the northeast Pacific Ocean offshore Washington in 2012. Crone *et al.* (2014) analyzed the received sound levels from the 2012 survey and reported that the actual distances to received levels that would constitute the exclusion and buffer zones were two to three times smaller than what Lamont-Doherty's modeling approach had predicted. While these results confirm the role that bathymetry plays in propagation, they also confirm that empirical measurements from the Gulf of Mexico survey likely over-estimated the size of the exclusion zones for the 2012 shallow-water seismic surveys in Washington. NMFS reviewed this information in consideration of how these data reflect on the accuracy of Lamont-Doherty's current modeling approach and we have concluded that the modeling of RMS distances likely results in predicted distances to acoustic thresholds (Table 2)

that are conservative, i.e., if actual distances to received sound levels deviate from distances predicted via modeling, actual distances are expected to be lesser, not greater, than predicted distances

Power-Down Procedures

A power down involves decreasing the number of airguns in use such that the radius of the 180-dB or 190-dB exclusion zone is smaller to the extent that marine mammals are no longer within or about to enter the exclusion zone. A power down of the airgun array can also occur when the vessel is moving from one seismic line to another. During a power down for mitigation, the *Langseth* would operate one airgun (40 in^3). The continued operation of one airgun would alert marine mammals to the presence of the seismic vessel in the area. A shutdown occurs when the *Langseth* suspends all airgun activity.

If the observer detects a marine mammal outside the exclusion zone and the animal is likely to enter the zone, the crew would power down the airguns to reduce the size of the 180-dB or 190-dB exclusion zone before the animal enters that zone. Likewise, if a marine mammal is already within the zone after detection, the crew would power down the airguns immediately. During a power down of the airgun array, the crew would operate a single 40-in^3 airgun which has a smaller exclusion zone. If the observer detects a marine mammal within or near the smaller exclusion zone around the airgun (Table 2), the crew would shut down the single airgun (see next section).

Resuming Airgun Operations after a Power Down

Following a power-down, the *Langseth* crew would not resume full airgun activity until the marine mammal has cleared the 180-dB or 190-dB exclusion zone. The observers would consider the animal to have cleared the exclusion zone if:

- The observer has visually observed the animal leave the exclusion zone; or
- An observer has not sighted the animal within the exclusion zone for 15 minutes for species with shorter dive durations (*i.e.*, small odontocetes or pinnipeds), or 30 minutes for species with longer dive durations (*i.e.*, mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales); or

The *Langseth* crew would resume operating the airguns at full power after 15 minutes of sighting any species with short dive durations (*i.e.*, small odontocetes or pinnipeds). Likewise, the crew would resume airgun operations at full power after 30 minutes of sighting any species with longer dive durations (*i.e.*, mysticetes and large odontocetes, including sperm, pygmy sperm, dwarf sperm, and beaked whales).

NMFS estimates that the *Langseth* would transit outside the original 180-dB or 190-dB exclusion zone after an eight-minute wait period. This period is based on the average speed of the *Langseth* while operating the airguns (8.5 km/h; 5.3 mph). Because the vessel has transited away from the vicinity of the original sighting during the eight-minute period, implementing ramp-up procedures for the full array after an extended power down (*i.e.*, transiting for an additional 35 minutes from the location of initial sighting) would not meaningfully increase the effectiveness of observing marine mammals approaching or entering the exclusion zone for the full source level and would not further minimize the potential for take. The *Langseth's* observers are continually monitoring the exclusion zone for the full source level while the mitigation airgun is firing. On average, observers can observe to the horizon (10 km; 6.2 mi) from the height of the *Langseth's* observation deck and should be able to say with a reasonable degree of confidence whether a marine mammal would be encountered within this distance before resuming airgun operations at full power.

Shutdown Procedures

The *Langseth* crew would shut down the operating airgun(s) if they see a marine mammal within or approaching the exclusion zone for the single airgun. The crew would implement a shutdown:

(1) If an animal enters the exclusion zone of the single airgun after the crew has initiated a power down; or

(2) If an observer sees the animal is initially within the exclusion zone of the single airgun when more than one airgun (typically the full airgun array) is operating.

Resuming Airgun Operations after a Shutdown

Following a shutdown in excess of eight minutes, the *Langseth* crew would initiate a ramp-up with the smallest airgun in the array (40-in^3). The crew would turn on additional airguns in a sequence such that the source level of the array would increase in steps not exceeding 6 dB per five-minute period over a total duration of approximately 30 minutes. During ramp-up, the observers would monitor the exclusion zone, and if a marine mammal were observed, the *Langseth* crew would implement a power down or shutdown as though the full airgun array were operational.

During periods of active seismic operations, there are occasions when the *Langseth* crew would need to temporarily shut down the airguns due to equipment failure or for maintenance. In this case, if the airguns are inactive longer than eight minutes, the crew would follow ramp-up procedures for a shutdown described earlier and the observers would monitor the full exclusion zone and would implement a power down or shutdown if necessary.

If the full exclusion zone is not visible to the observer for at least 30 minutes prior to the start of operations in either daylight or nighttime, the *Langseth* crew would not commence ramp-

up unless at least one airgun (40-in^3 or similar) has been operating during the interruption of seismic survey operations. Given these provisions, it is likely that the vessel's crew would not ramp up the airgun array from a complete shutdown at night or in thick fog, because the outer part of the zone for that array would not be visible during those conditions.

If one airgun has operated during a power down period, ramp-up to full power would be permissible at night or in poor visibility, on the assumption that marine mammals would be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away. The vessel's crew would not initiate a ramp-up of the airguns if an observer sees the marine mammal within or near the applicable exclusion zones during the day or close to the vessel at night.

Ramp-up Procedures

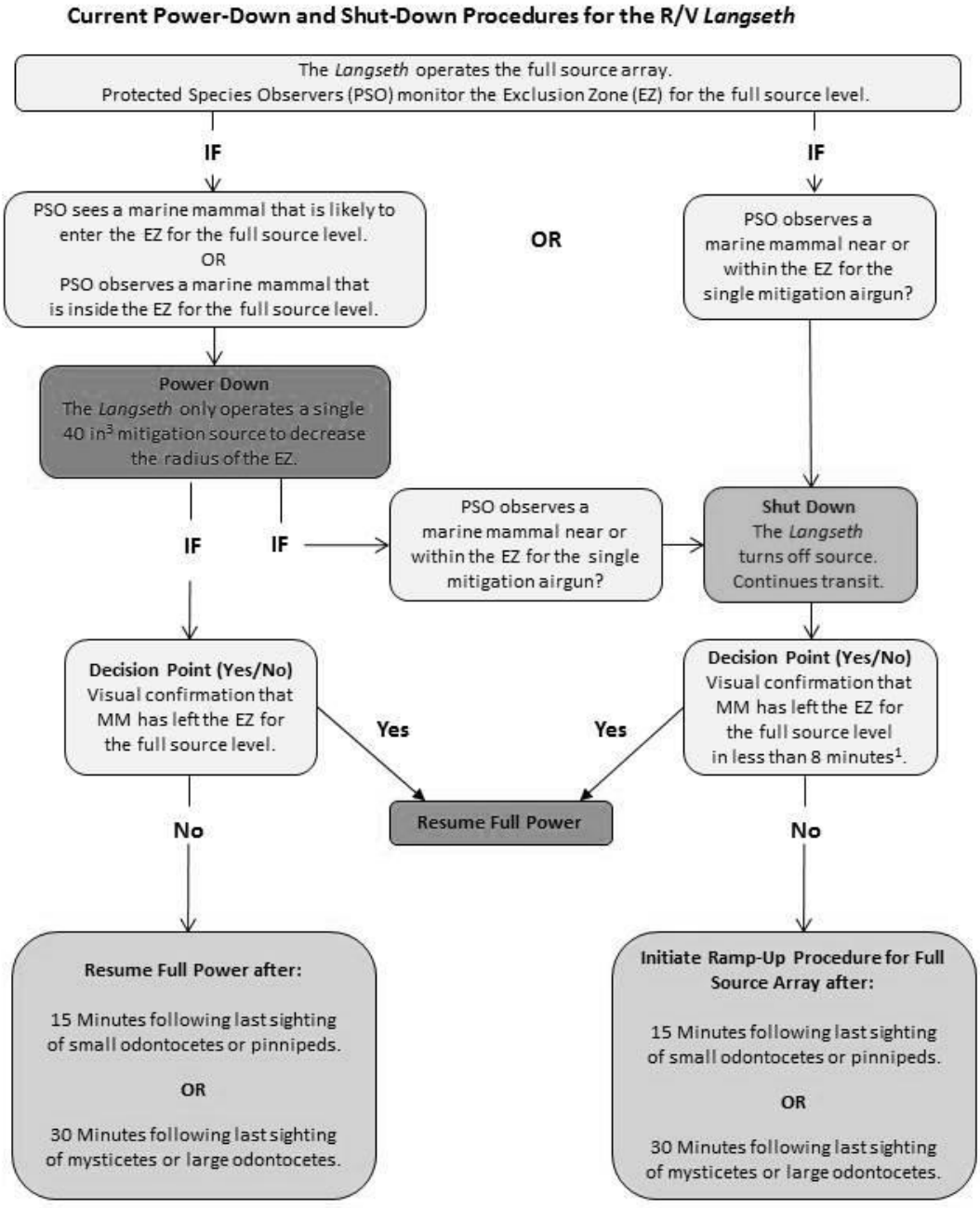
Ramp-up of an airgun array provides a gradual increase in sound levels, and involves a step-wise increase in the number and total volume of airguns firing until the full volume of the airgun array is achieved. The purpose of a ramp-up is to "warn" marine mammals in the vicinity of the airguns, and to provide the time for them to leave the area and thus avoid any potential injury or impairment of their hearing abilities. Lamont-Doherty would follow a ramp-up procedure when the airgun array begins operating after an 8 minute period without airgun operations or when shut down has exceeded that period. Lamont-Doherty has used similar waiting periods (approximately eight to 10 minutes) during previous seismic surveys.

Ramp-up would begin with the smallest airgun in the array (40 in^3). The crew would add airguns in a sequence such that the source level of the array would increase in steps not exceeding six dB per five minute period over a total duration of approximately 30 to 35 minutes. During ramp-up, the observers would monitor the exclusion zone, and if marine mammals are

sighted, Lamont-Doherty would implement a power-down or shutdown as though the full airgun array were operational.

If the complete exclusion zone has not been visible for at least 30 minutes prior to the start of operations in either daylight or nighttime, Lamont-Doherty would not commence the ramp-up unless at least one airgun (40 in^3 or similar) has been operating during the interruption of seismic survey operations. Given these provisions, it is likely that the crew would not ramp up the airgun array from a complete shutdown at night or in thick fog, because the outer part of the exclusion zone for that array would not be visible during those conditions. If one airgun has operated during a power-down period, ramp-up to full power would be permissible at night or in poor visibility, on the assumption that marine mammals would be alerted to the approaching seismic vessel by the sounds from the single airgun and could move away. Lamont-Doherty would not initiate a ramp-up of the airguns if an observer sights a marine mammal within or near the applicable exclusion zones. NMFS refers the reader to Figure 1, which presents a flowchart representing the ramp-up, power down, and shutdown protocols described in this notice.

Figure 1. Ramp-up, power down, and shut-down procedures for the *Langseth*.



[1] Ramp-Up Procedures

For a given survey, Lamont-Doherty would calculate a specified period based on the 180-dB exclusion zone radius in relation to the average planned speed of the *Langseth* while surveying . Lamont-Doherty has used similar periods (8-10 minutes) for previous surveys. Ramp up will not occur if a marine mammal or sea turtle has not cleared the exclusion zone for the full array.

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Special Procedures for Concentrations of Large Whales

The *Langseth* would avoid exposing concentrations of large whales to sounds greater than 160 dB re: 1 µPa within the 160-dB zone and would power down the array, if necessary. For purposes of this survey, a concentration or group of whales would consist of six or more individuals visually sighted that do not appear to be traveling (*e.g.*, feeding, socializing, etc.).

Speed and Course Alterations

If, during seismic data collection, Lamont-Doherty detects a marine mammal outside the exclusion zone that appears likely to enter the exclusion zone based on the animal's position and direction of travel, the *Langseth* would change speed and/or direction if this does not compromise operational safety. Due to the limited maneuverability of the primary survey vessel, altering speed, and/or course can result in an extended period of time to realign the *Langseth* to the transect line. However, if the animal(s) appear likely to enter the exclusion zone, the *Langseth* would undertake further mitigation actions, including a power down or shutdown of the airguns.

Mitigation Conclusions

NMFS has carefully evaluated Lamont-Doherty's mitigation measures in the context of ensuring that we prescribe the means of effecting the least practicable impact on the affected marine mammal species and stocks and their habitat. Our evaluation of potential measures included consideration of the following factors in relation to one another:

- The manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals;
- The proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and

- The practicability of the measure for applicant implementation.

Any mitigation measure(s) prescribed by NMFS should be able to accomplish, have a reasonable likelihood of accomplishing (based on current science), or contribute to the accomplishment of one or more of the general goals listed here:

1. Avoidance or minimization of injury or death of marine mammals wherever possible (goals 2, 3, and 4 may contribute to this goal).

2. A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

3. A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to 1, above, or to reducing harassment takes only).

4. A reduction in the intensity of exposures (either total number or number at biologically important time or location) to airgun operations that we expect to result in the take of marine mammals (this goal may contribute to a, above, or to reducing the severity of harassment takes only).

5. Avoidance or minimization of adverse effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time.

6. For monitoring directly related to mitigation—an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation.

Based on the evaluation of Lamont-Doherty's planned measures, as well as other measures developed by NMFS (*i.e.*, special procedures for concentrations of large whales), NMFS has determined that the planned mitigation measures provide the means of effecting the least practicable impact on marine mammal species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

Monitoring Measures

In order to issue an Incidental Harassment Authorization for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking." The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for Authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that we expect to be present in the action area.

Monitoring measures prescribed by NMFS should accomplish one or more of the following general goals:

1. An increase in the probability of detecting marine mammals, both within the mitigation zone (thus allowing for more effective implementation of the mitigation) and during other times and locations, in order to generate more data to contribute to the analyses mentioned later;

2. An increase in our understanding of how many marine mammals would be affected by seismic airguns and other active acoustic sources and the likelihood of associating those

exposures with specific adverse effects, such as behavioral harassment, temporary or permanent threshold shift;

3. An increase in our understanding of how marine mammals respond to stimuli that we expect to result in take and how those anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically through effects on annual rates of recruitment or survival) through any of the following methods:

a. Behavioral observations in the presence of stimuli compared to observations in the absence of stimuli (*i.e.*, to be able to accurately predict received level, distance from source, and other pertinent information);

b. Physiological measurements in the presence of stimuli compared to observations in the absence of stimuli (*i.e.*, to be able to accurately predict received level, distance from source, and other pertinent information);

c. Distribution and/or abundance comparisons in times or areas with concentrated stimuli versus times or areas without stimuli;

4. An increased knowledge of the affected species; and

5. An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

Lamont-Doherty plans to conduct marine mammal monitoring during the planned project to supplement the mitigation measures that include real-time monitoring (see "Vessel-based Visual Mitigation Monitoring" above), and to satisfy the monitoring requirements of the Authorization.

Vessel-Based Passive Acoustic Monitoring

Passive acoustic monitoring would complement the visual mitigation monitoring program, when practicable. Visual monitoring typically is not effective during periods of poor visibility or at night, and even with good visibility, is unable to detect marine mammals when they are below the surface or beyond visual range. Passive acoustic monitoring can improve detection, identification, and localization of cetaceans when used in conjunction with visual observations. The passive acoustic monitoring would serve to alert visual observers (if on duty) when vocalizing cetaceans are detected. It is only useful when marine mammals call, but it can be effective either by day or by night, and does not depend on good visibility. The acoustic observer would monitor the system in real time so that he/she can advise the visual observers if they acoustically detect cetaceans.

The passive acoustic monitoring system consists of hardware (*i.e.*, hydrophones) and software. The "wet end" of the system consists of a towed hydrophone array connected to the vessel by a tow cable. The tow cable is 250 m (820.2 ft) long and the hydrophones are fitted in the last 10 m (32.8 ft) of cable. A depth gauge, attached to the free end of the cable, typically towed at depths less than 20 m (65.6 ft). The *Langseth* crew would deploy the array from a winch located on the back deck. A deck cable would connect the tow cable to the electronics unit in the main computer lab where the acoustic station, signal conditioning, and processing system would be located. The Pamguard software amplifies, digitizes, and then processes the acoustic signals received by the hydrophones. The system can detect marine mammal vocalizations at frequencies up to 250 kHz.

One acoustic observer, an expert bioacoustician with primary responsibility for the passive acoustic monitoring system would be aboard the *Langseth* in addition to the other visual observers who would rotate monitoring duties. The acoustic observer would monitor the towed

hydrophones 24 hours per day during airgun operations and during most periods when the *Langseth* is underway while the airguns are not operating. However, passive acoustic monitoring may not be possible if damage occurs to both the primary and back-up hydrophone arrays during operations. The primary passive acoustic monitoring streamer on the *Langseth* is a digital hydrophone streamer. Should the digital streamer fail, back-up systems should include an analog spare streamer and a hull-mounted hydrophone.

One acoustic observer would monitor the acoustic detection system by listening to the signals from two channels via headphones and/or speakers and watching the real-time spectrographic display for frequency ranges produced by cetaceans. The observer monitoring the acoustical data would be on shift for one to six hours at a time. The other observers would rotate as an acoustic observer, although the expert acoustician would be on passive acoustic monitoring duty more frequently.

When the acoustic observer detects a vocalization while visual observations are in progress, the acoustic observer on duty would contact the visual observer immediately, to alert him/her to the presence of cetaceans (if they have not already been seen), so that the vessel's crew can initiate a power down or shutdown, if required. The observer would enter the information regarding the call into a database. Data entry would include an acoustic encounter identification number, whether it was linked with a visual sighting, date, time when first and last heard and whenever any additional information was recorded, position and water depth when first detected, bearing if determinable, species or species group (*e.g.*, unidentified dolphin, sperm whale), types and nature of sounds heard (*e.g.*, clicks, continuous, sporadic, whistles, creaks, burst pulses, strength of signal, etc.), and any other notable information. Acousticians record the acoustic detection for further analysis.

Observer Data and Documentation

Observers would record data to estimate the numbers of marine mammals exposed to various received sound levels and to document apparent disturbance reactions or lack thereof. They would use the data to help better understand the impacts of the activity on marine mammals and to estimate numbers of animals potentially 'taken' by harassment (as defined in the MMPA). They will also provide information needed to order a power down or shut down of the airguns when a marine mammal is within or near the exclusion zone.

When an observer makes a sighting, they will record the following information:

1. Species, group size, age/size/sex categories (if determinable), behavior when first sighted and after initial sighting, heading (if consistent), bearing and distance from seismic vessel, sighting cue, apparent reaction to the airguns or vessel (*e.g.*, none, avoidance, approach, paralleling, etc.), and behavioral pace.

2. Time, location, heading, speed, activity of the vessel, sea state, visibility, and sun glare.

3. The observer will record the data listed under (2) at the start and end of each observation watch, and during a watch whenever there is a change in one or more of the variables.

4. Observers will record all observations and power downs or shutdowns in a standardized format and will enter data into an electronic database. The observers will verify the accuracy of the data entry by computerized data validity checks during data entry and by subsequent manual checking of the database. These procedures will allow the preparation of initial summaries of data during and shortly after the field program, and will facilitate transfer of the data to statistical, graphical, and other programs for further processing and archiving.

Results from the vessel-based observations will provide:

1. The basis for real-time mitigation (airgun power down or shutdown).

2. Information needed to estimate the number of marine mammals potentially taken by harassment, which Lamont-Doherty must report to the Office of Protected Resources.

3. Data on the occurrence, distribution, and activities of marine mammals and turtles in the area where Lamont-Doherty would conduct the seismic study.

4. Information to compare the distance and distribution of marine mammals and turtles relative to the source vessel at times with and without seismic activity.

5. Data on the behavior and movement patterns of marine mammals detected during non-active and active seismic operations.

Reporting Measures

Lamont-Doherty will submit a report to NMFS and to NSF within 90 days after the end of the cruise. The report will describe the operations conducted and sightings of marine mammals near the operations. The report will provide full documentation of methods, results, and interpretation pertaining to all monitoring. The 90-day report will summarize the dates and locations of seismic operations, and all marine mammal sightings (dates, times, locations, activities, associated seismic survey activities).

The report will also include estimates of the number and nature of exposures that occurred above the harassment threshold based on the observations and in consideration of the detectability of the marine mammal species observed (e.g., in consideration of factors such as g(0) or f(0)). Lamont-Doherty must provide an estimate of the number (by species) of marine mammals that may have been exposed (based on modeling results and accounting for animals at the surface but not detected [i.e., g(0) values] and for animals present but underwater and not

available for sighting [i.e., f(0) values]) to the seismic activity at received levels greater than or equal to 160 dB re: 1 μPa and/or 180 dB re 1 μPa for cetaceans and 190-dB re 1 μPa for pinnipeds. NMFS includes this requirement for post-survey exposure estimates in acknowledgement of the uncertainty inherent in the pre-survey take estimates, and these post-survey corrections are intended to provide a relative qualitative sense of the accuracy of the pre-survey take estimates based on the marine mammals actually observed during the survey and the factors described above. However, it is important to note that these corrections, while helpful in utilizing the most appropriate surrogate numbers, will utilize values determined by species behavior in other areas (f(0)) and detection probabilities calculated for different observers in different environmental conditions (g(0)). Additionally, correction factors of this nature are likely more effective over more extensive targeted marine mammal survey efforts, whereas for a shorter survey such as the one considered here, the patchiness of marine mammal occurrence makes quantitative accuracy less likely. Therefore, while the corrected post-survey exposure estimates certainly improve upon exposure assumptions based solely on observation, and may appropriately be used to qualitatively inform future take estimates, they should not be construed as an indicator that the corrected number of marine mammals equates to the number of marine mammals definitively taken during the survey.

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner not permitted by the authorization (if issued), such as an injury, serious injury, or mortality (*e.g.*, ship-strike, gear interaction, and/or entanglement), Lamont-Doherty shall immediately cease the specified activities and immediately report the take to the Chief Permits and Conservation Division, Office of Protected Resources, NMFS. The report must include the following information:

- Time, date, and location (latitude/longitude) of the incident;
- Name and type of vessel involved;
- Vessel's speed during and leading up to the incident;
- Description of the incident;
- Status of all sound source use in the 24 hours preceding the incident;
- Water depth;
- Environmental conditions (*e.g.*, wind speed and direction, Beaufort sea state, cloud cover, and visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Lamont-Doherty shall not resume its activities until NMFS is able to review the circumstances of the prohibited take. NMFS would work with Lamont-Doherty to determine what is necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. Lamont-Doherty may not resume their activities until notified by NMFS via letter, email, or telephone.

In the event that Lamont-Doherty discovers an injured or dead marine mammal, and the lead visual observer determines that the cause of the injury or death is unknown and the death is relatively recent (*i.e.*, in less than a moderate state of decomposition as we describe in the next paragraph), Lamont-Doherty will immediately report the incident to the Chief Permits and Conservation Division, Office of Protected Resources, NMFS. The report must include the same

information identified in the paragraph above this section. Activities may continue while NMFS reviews the circumstances of the incident. NMFS would work with Lamont-Doherty to determine whether modifications in the activities are appropriate.

In the event that Lamont-Doherty discovers an injured or dead marine mammal, and the lead visual observer determines that the injury or death is not associated with or related to the authorized activities (*e.g.*, previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), Lamont-Doherty would report the incident to the Chief Permits and Conservation Division, Office of Protected Resources, NMFS, within 24 hours of the discovery. Lamont-Doherty would provide photographs or video footage (if available) or other documentation of the stranded animal sighting to NMFS.

Estimated Take by Incidental Harassment

Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

Acoustic stimuli (*i.e.*, increased underwater sound) generated during the operation of the airgun array may have the potential to result in the behavioral disturbance of some marine mammals and may have an even smaller potential to result in permanent threshold shift (non-lethal injury) of some marine mammals. NMFS expects that the mitigation and monitoring measures would minimize the possibility of injurious or lethal takes. However, NMFS cannot discount the possibility (albeit small) that exposure to sound from the planned survey could

result in non-lethal injury (Level A harassment). Thus, NMFS authorizes take by Level B harassment and Level A harassment resulting from the operation of the sound sources for the planned seismic survey based upon the current acoustic exposure criteria shown in Table 3, subject to the limitations in take described in Tables 4 – 7 later in this notice.

Table 3. NMFS's Current Acoustic Exposure Criteria.

Criterion	Criterion Definition	Threshold
Level A Harassment (Injury)	Permanent Threshold Shift (PTS) (Any level above that which is known to cause TTS)	180 dB re 1 microPa-m (cetaceans) / 190 dB re 1 microPa-m (pinnipeds) root mean square (rms)
Level B Harassment	Behavioral Disruption (for impulse noises)	160 dB re 1 microPa-m (rms)

NMFS's practice is to apply the 160 dB re: 1 µPa received level threshold for underwater impulse sound levels to predict whether behavioral disturbance that rises to the level of Level B harassment is likely to occur. NMFS's practice is to apply the 180 dB or 190 dB re: 1 µPa (for cetaceans and pinnipeds, respectively) received level threshold for underwater impulse sound levels to predict whether permanent threshold shift (auditory injury), which we consider as harassment (Level A), is likely to occur.

Acknowledging Uncertainties in Estimating Take

Given the many uncertainties in predicting the quantity and types of impacts of sound on marine mammals, it is common practice for us to estimate how many animals are likely to be present within a particular distance of a given activity, or exposed to a particular level of sound. We use this information to predict how many animals potentially could be taken. In practice, depending on the amount of information available to characterize daily and seasonal movement and distribution of affected marine mammals, distinguishing between the numbers of individuals harassed and the instances of harassment can be difficult to parse. Moreover, when one considers

the duration of the activity, in the absence of information to predict the degree to which individual animals are likely exposed repeatedly on subsequent days, one assumption is that entirely new animals could be exposed every day, which results in a take estimate that in some circumstances overestimates the number of individuals harassed.

The following sections describe Lamont-Doherty's and NMFS's methods to estimate take by incidental harassment. We base these estimates on the number of marine mammals that are estimated to be exposed to seismic airgun sound levels above the Level B harassment threshold of 160 dB during a total of approximately 9,633 km (5,986 mi) of transect lines in the southeast Pacific Ocean.

Density Estimates: Lamont-Doherty was unable to identify any systematic aircraft- or ship-based surveys conducted for marine mammals in waters of the southeast Pacific Ocean offshore Chile. Lamont-Doherty used densities from NMFS Southwest Fisheries Science Center (SWFSC) cruises (Ferguson and Barlow, 2001, 2003; Barlow 2003, 2010; Forney, 2007) in the California Current, which is similar to the Humboldt Current Coastal area in which the planned surveys are located. Both are eastern boundary currents that feature narrow continental shelves, upwelling, high productivity, and fluctuating fishery resources (sardines and anchovies). The densities used were survey effort-weighted means for the locations (blocks or states). In cases where multiple density estimates existed for an area, Lamont-Doherty used the highest density range (summer/fall) for each species within the survey area. We refer the reader to Lamont-Doherty's application for detailed information on how Lamont-Doherty calculated densities for marine mammals from the SWFSC cruises.

For blue whales in the southern survey area, NMFS used the density (9.56/km^2) reported by Galletti Vernazzani *et al*. (2012) for approximately four days of the planned southern survey

to account for potential survey operations occurring near a known foraging area between 39º S and 44º S. For the remaining 31 days of the planned survey, NMFS used the density estimate presented in Lamont-Doherty's application (2.07/km^2). NMFS considers Lamont-Doherty's approach to calculating densities for the remaining marine mammal species in the survey areas as the best available information. We present the estimated densities (when available) in Tables 4, 5, and 6 in this notice.

Modeled Number of Instances of Exposures: Lamont-Doherty will conduct the planned seismic surveys offshore Chile in the southeast Pacific Ocean and presented NMFS with estimates of the anticipated numbers of instances that marine mammals could be exposed to sound levels greater than or equal to 160, 180, and 190 dB re: 1 μPa during the planned seismic survey (outside the Chilean territorial sea) in Tables 3, 4, and 5 in their application. NMFS independently reviewed these estimates and presents revised estimates of the anticipated numbers of instances that marine mammals could be exposed to sound levels greater than or equal to 160, 180, and 190 dB re: 1 μPa during the planned seismic survey (outside the Chilean territorial sea) in Tables 4, 5, and 6 in this notice. Table 7 presents the total numbers of instances of take that NMFS authorizes. As described above, NMFS cannot authorize the incidental take of marine mammals in the territorial seas of foreign nations, as the MMPA does not apply in those waters; therefore the total numbers of instances of take that NMFS authorizes represents only the takes predicted to occur outside of the Chilean territorial sea (Table 7)

Take Estimate Method for Species with Density Information: Briefly, we take the estimated density of marine mammals within an area (animals/km^2) and multiply that number by the daily ensonified area (km^2). The product (rounded) is the number of instance of take within one day. We then multiply the number of instances of take within one day by the number of

survey days (plus 25 percent contingency). The result is an estimate of the potential number of instances that marine mammals could be exposed to airgun sounds above the Level B harassment threshold (*i.e.*, the 160 dB ensonified area minus the 180/190-dB ensonified area) and the Level A harassment threshold (*i.e.*, the 180/190-dB ensonified area only) over the duration of each planned survey.

There is some uncertainty about the representativeness of the estimated density data and the assumptions used in their calculations. Oceanographic conditions, including occasional El Niño and La Niña events, influence the distribution and numbers of marine mammals present in the eastern tropical Pacific Ocean, resulting in considerable year-to-year variation in the distribution and abundance of many marine mammal species. Thus, for some species, the densities derived from past surveys may not be representative of the densities that would be encountered during the planned seismic surveys. However, the approach used is based on the best available data.

In many cases, this estimate of instances of exposures is likely an overestimate of the number of individuals that are taken, because it assumes 100 percent turnover in the area every day, (*i.e.*, that each new day results in takes of entirely new individuals with no repeat takes of the same individuals over the three periods (northern: 35 days; central: 6 days; and southern: 34 days) including contingency. It is difficult to quantify to what degree this method overestimates the number of individuals potentially taken. Except as described later for a few specific species, NMFS uses this number of instances as the estimate of individuals (and authorized take).

Take Estimates for Species with Less than One Instance of Exposure: Using the approach described earlier, the model generated instances of take for some species that were less than one over the 75 total survey days. Those species include: Bryde's, dwarf sperm, killer, and sei whale.

NMFS used data based on dedicated survey sighting information from the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013 (AMAPPS, 2010, 2011, 2013) to estimate take and assumed that Lamont-Doherty could potentially encounter one group of each species during the planned seismic survey. NMFS believes it is reasonable to use the average (mean) group size (weighted by effort and rounded up) from the AMMAPS surveys for Bryde's whale (2), dwarf sperm whale (2), killer whale (4), and sei whale (3) to derive a reasonable estimate of take for eruptive occurrences of each these species only once for each survey.

Take Estimates for Species with No Density Information: Density information for the southern right whale, pygmy right whale, Antarctic minke whale, sei whale, dwarf sperm whale, Shephard's beaked whale, pygmy beaked whale, southern bottlenose whale, hourglass dolphin, pygmy killer whale, false killer whale; short-finned pilot whale, Juan Fernandez fur seal, and southern elephant seal in the southeast Pacific Ocean is data poor or non-existent. When density estimates were not available for a particular survey leg, NMFS used data based on dedicated survey sighting information from the Atlantic Marine Assessment Program for Protected Species (AMAPPS) surveys in 2010, 2011, and 2013 (AMAPPS, 2010, 2011, 2013) and from Santora (2012) to estimate mean group size and take for these species. NMFS assumed that Lamont-Doherty could potentially encounter one group of each species each day during the seismic survey. NMFS believes it is reasonable to use the average (mean) group size (weighted by effort and rounded up) for each species multiplied by the number of survey days to derive an estimate of take from potential encounters.

Table 4. Densities of marine mammals and estimates of incidents of exposure to ≥160 and 180 or 190 dB re 1 µPa rms predicted during the northern seismic survey in the southeast Pacific Ocean in 2016/2017 (outside Chilean territorial sea).

Species	Density Estimate [1]	Modeled Number of Instances of Exposures to Sound Levels ≥ 160, 180, and 190 dB[2]	Level A Take[3]	Level B Take
Southern right whale	0	105, 0, -	0	105
Humpback whale	0.32	35, 0, -	0	35
Common (dwarf) minke whale	0.34	35, 0 -	0	35
Antarctic minke whale	0	70, 0, -	0	70
Bryde's whale	0.47	35, 0, 0	0	35
Sei whale	0	105, 0, -	0	105
Fin whale	1.4	105, 35, -	35	105
Blue whale	0.54	35, 0, -	0	35
Sperm whale	1.19	70, 0, -	0	70
Dwarf sperm whale	8.92	630, 105, -	105	630
Pygmy sperm whale	2.73	210, 35, -	35	210
Cuvier's beaked whale	2.36	175, 35, -	35	175
Pygmy beaked whale	0.7	35, 0, -	0	35
Gray's beaked whale	1.95	140, 35, -	35	140
Blainville's beaked whale	1.95	140, 35, -	35	140
Rough-toothed dolphin	7.05	490, 105, -	105	490
Common bottlenose dolphin	18.4	1,330, 245, -	245	1,330
Striped dolphin	61.4	4,410, 805, -	805	4,410
Short-beaked common dolphin	356.3	25,515, 4,725, -	4,725	25,515
Long-beaked common dolphin	50.3	3,605, 665, -	665	3,605
Dusky dolphin	13.7	980, 175, -	175	980
Southern right whale dolphin	3.34	245, 35, -	35	245
Risso's dolphin	29.8	2,135, 385, -	385	2,135
Pygmy killer whale	1.31	105, 0, -	0	105
False killer whale	0.63	35, 0, -	0	35
Killer whale	0.23	4, 0, -	0	4
Short-finned pilot whale	0	700, 0, -	0	700
Long-finned pilot whale	1.09	70, 0, -	0	70
Burmeister's porpoise	5.15	385, 70, -	70	385
Juan Fernandez fur seal	0	70, -, 0	0	70

South American fur seal	37.9	2,730, -, 490	490	2,730
South American sea lion	393	28,140, -, 5,215	5,215	28,140

[1] Densities shown (when available) are 1,000 animals per km^2. See Lamont-Doherty's application and text in this notice for a summary of how Lamont-Doherty derived density estimates for certain species. For species without density estimates, see text in this notice for an explanation of NMFS's methodology to derive take estimates.

[2] Take modeled using a daily method for calculating ensonified area: estimated density multiplied by the daily ensonified area to derive instances of take in one day (rounded) multiplied by the number of survey days with 25 percent contingency (35) Level B take = modeled instances of exposure within the 160-dB ensonified area minus the 180-dB or 190-dB ensonified area. Level A take = modeled instances of exposures within the 180-dB or 190-dB ensonified area only. Modeled instances of exposures include adjustments for species with no density information or with species having less than one instance of exposure (see text for sources).

[3] The Level A estimates are overestimates of predicted impacts to marine mammals as the estimates do not take into consideration the required mitigation measures for shutdowns or power downs if a marine mammal is likely to enter the 180 or 190 dB exclusion zone while the airguns are active.

Table 5. Densities of marine mammals and estimates of incidents of exposure to ≥160 and 180 or 190 dB re 1 µPa rms predicted during the central seismic survey in the southeast Pacific Ocean in 2016/2017 (outside Chilean territorial sea).

Species	Density Estimate [1]	Modeled Number of Instances of Exposures to Sound Levels ≥ 160, 180, and 190 dB[2]	Level A Take[3]	Level B Take
Southern right whale	0	18, 0, -	0	18
Pygmy right whale	0	18, 0, -	0	18
Humpback whale	0.43	6, 0, -	0	6
Common (dwarf) minke whale	0.34	6, 0, -	0	6
Antarctic minke whale	0	12, 0, -	0	12
Bryde's whale	0.41	6, 0, -	0	6
Sei whale	0	18, 0, -	0	18
Fin whale	1.96	18, 6, -	6	18
Blue whale	2.1	18, 6, -	6	18
Sperm whale	1.22	12, 0, -	0	12
Dwarf sperm whale	7.98	78, 12, -	12	78
Pygmy sperm whale	2.98	30, 6, -	6	30
Cuvier's beaked whale	3.02	30, 6, -	6	30
Shepard's beaked whale	0	18, 0, -	0	18
Hector's beaked whale	1.54	18, 0, -	0	18
Pygmy beaked whale	0.55	6, 0, -	0	6
Gray's beaked whale	1.54	18, 0, -	0	18
Blainville's beaked	1.54	18, 0, -	0	18

whale				
Andrew's beaked whale	1.54	18, 0, -	0	18
Strap-toothed beaked whale	1.54	18, 0, -	0	18
Spade-toothed beaked whale	1.54	18, 0, -	0	18
Chilean dolphin	21.2	210, 36, -	36	210
Common bottlenose dolphin	12.3	120, 24, -	24	120
Striped dolphin	46.7	462, 84, -	84	462
Short-beaked common dolphin	503.5	4,998, 908, -	906	4,998
Dusky dolphin	14.8	144, 24, -	24	144
Peale's dolphin	21.2	210, 36, -	36	210
Hourglass dolphin	0	30, 0, -	0	30
Southern right whale dolphin	6.07	60, 12, -	12	60
Risso's dolphin	21.2	210, 36, -	36	210
Pygmy killer whale	0	12, 0, -	0	12
False killer whale	0.54	6, 0, -	0	6
Killer whale	0.28	4, 0, -	0	4
Short-finned pilot whale	0	120, 0, -	0	120
Long-finned pilot whale	0.94	12, 0, -	0	12
Burmeister's porpoise	4.92	48, 6, -	6	48
Juan Fernandez fur seal	0	12, -, 0	0	12
South American fur seal	37.9	378, -, 66	66	378
South American sea lion	393	3,900, -, 708	708	3,900
Southern elephant seal	0	24, -, 0	0	24

[1] Densities shown (when available) are 1,000 animals per km^2. See Lamont-Doherty's application and text in this notice for a summary of how Lamont-Doherty derived density estimates for certain species. For species without density estimates, see text in this notice for an explanation of NMFS's methodology to derive take estimates.

[2] Take modeled using a daily method for calculating ensonified area: estimated density multiplied by the daily ensonified area to derive instances of take in one day (rounded) multiplied by the number of survey days with 25 percent contingency (35) Level B take = modeled instances of exposure within the 160-dB ensonified area minus the 180-dB or 190-dB ensonified area. Level A take = modeled instances of exposures within the 180-dB or 190-dB ensonified area only. Modeled instances of exposures include adjustments for species with no density information or with species having less than one instance of exposure (see text for sources).

[3] The Level A estimates are overestimates of predicted impacts to marine mammals as the estimates do not take into consideration the required mitigation measures for shutdowns or power downs if a marine mammal is likely to enter the 180 or 190 dB exclusion zone while the airguns are active.

Table 6. Densities of marine mammals and estimates of incidents of exposure to ≥160 and 180 or 190 dB re 1 µPa rms predicted during the southern seismic survey in the southeast Pacific Ocean in 2016/2017 (outside Chilean territorial sea).

Species	Density Estimate [1]	Modeled Number of Instances of Exposures to Sound Levels ≥ 160, 180, and 190 dB[2]	Level A Take[3]	Level B Take
Southern right whale	0	102, 0, -	0	102
Pygmy right whale	0	102, 0, -	0	102
Humpback whale	1.22	102, 0, -	0	102
Common (dwarf) minke whale	0.61	34, 0, -	0	34
Antarctic minke whale	0	68, 0, -	0	68
Bryde's whale	0.03	2, 0, -	0	2
Sei whale	0.02	3, 0, -	0	3
Fin whale	2.43	170, 34, -	34	170
Blue whale (Feb-Apr)	9.56	80, 12, -	12	80
Blue whale (May - Jan)	2.07	124, 31, -	31	124
Sperm whale	1.32	102, 0, -	0	102
Dwarf sperm whale	0	68, 0, -	0	68
Pygmy sperm whale	4.14	306, 34, -	34	306
Cuvier's beaked whale	4.02	272, 34, -	34	272
Shepard's beaked whale	0	102, 0, -	0	102
Hector's beaked whale	0.31	34, 0, -	0	34
Pygmy beaked whale	0	102, 0, -	0	102
Gray's beaked whale	1.95	136, 34, -	34	136
Blainville's beaked whale	0.31	34, 0, -	0	34
Andrew's beaked whale	0.31	34, 0, -	0	34
Strap-toothed beaked whale	0.31	34, 0, -	0	34
Spade-toothed beaked whale	0.31	34, 0, -	0	34
Southern bottlenose whale	0	102, 0, -	0	102
Chilean dolphin	10.9	748, 136, 0	136	748
Common bottlenose dolphin	2.72	204, 34, -	34	204
Striped dolphin	17.7	1,224, 204, -	204	1,224
Short-beaked common dolphin	516.9	36,210, 5,950, -	5,950	36,210
Dusky dolphin	29.9	2,108, 340, -	340	2,108
Peale's dolphin	10.9	748, 136, -	136	748

Hourglass dolphin	0	170, 0, -	0	170
Southern right whale dolphin	9.79	680, 102, -	102	680
Risso's dolphin	10.9	748, 136, -	136	748
Pygmy killer whale	0	68, 0, -	0	68
False killer whale	0	238, 0, -	0	238
Killer whale	0.73	68, 0, -	0	68
Short-finned pilot whale	0	680, 0, -	0	680
Long-finned pilot whale	0.53	34, 0, -	0	34
Burmeister's porpoise	55.4	3,876, 646, -	646	3,876
Juan Fernandez fur seal	0	68, -, 0	0	68
South American fur seal	37.9	2,652, -, 442	442	2,652
South American sea lion	393	27,540, -, 4,522	4,522	27,540
Southern elephant seal	0	136, -, 0	0	136

[1] Densities shown (when available) are 1,000 animals per km^2. See Lamont-Doherty's application and text in this notice for a summary of how Lamont-Doherty derived density estimates for certain species. For species without density estimates, see text in this notice for an explanation of NMFS's methodology to derive take estimates.

[2] Take modeled using a daily method for calculating ensonified area: estimated density multiplied by the daily ensonified area to derive instances of take in one day (rounded) multiplied by the number of survey days with 25 percent contingency (35) Level B take = modeled instances of exposure within the 160-dB ensonified area minus the 180-dB or 190-dB ensonified area. Level A take = modeled instances of exposures within the 180-dB or 190-dB ensonified area only. Modeled instances of exposures include adjustments for species with no density information or with species having less than one instance of exposure (see text for sources).

[3] The Level A estimates are overestimates of predicted impacts to marine mammals as the estimates do not take into consideration the required mitigation measures for shutdowns or power downs if a marine mammal is likely to enter the 180 or 190 dB exclusion zone while the airguns are active.

Table 7. Take authorized during the northern, central, and southern seismic survey off Chile in the southeast Pacific Ocean in 2016/2017 based on total predicted incidents of exposure to ≥160 and 180 or 190 dB re 1 µPa rms (outside Chilean territorial sea).

Species	Level A Take[1]	Level B Take	Total Take	Percent of Population [2]
Southern right whale	0	225	225	1.9%
Pygmy right whale	0	120	120	Unknown
Humpback whale	0	143	143	0.3%
Common (dwarf) minke whale	0	75	75	0.02%
Antarctic minke whale	0	150	150	0.03%
Bryde's whale	0	43	43	0.1%
Sei whale	0	126	126	1.3%
Fin whale	75	293	368	1.7%

Blue whale	49	257	306	3.1%
Sperm whale	0	184	184	0.1%
Dwarf sperm whale	117	776	893	0.5%
Pygmy sperm whale	75	546	621	0.4%
Cuvier's beaked whale	75	477	552	2.8%
Shepard's beaked whale	0	120	120	0.5%
Pygmy beaked whale	0	143	143	0.6%
Gray's beaked whale	69	294	363	1.4%
Blainville's beaked whale	35	192	227	0.9%
Hector's beaked whale	0	52	52	0.2%
Gray's beaked whale	69	294	363	1.4%
Andrew's beaked whale	0	52	52	0.2%
Strap-toothed beaked whale	0	52	52	0.2%
Spade-toothed beaked whale	0	52	52	0.2%
Southern bottlenose whale	0	102	102	0.1%
Chilean dolphin	172	958	1,130	11.3%
Rough-toothed dolphin	105	490	595	0.1%
Common bottlenose dolphin	303	1,654	1,957	0.1%
Striped dolphin	1,093	6,096	7,189	0.1%
Short-beaked common dolphin	11,581	66,723	78,304	4.4%
Long-beaked common dolphin	665	3,605	4,270	2.9%
Dusky dolphin	539	3,232	3,771	14.6%
Peale's dolphin	172	958	1,130	Unknown
Hourglass dolphin	0	200	200	0.1%
Southern right whale dolphin	149	985	1,134	Unknown
Risso's dolphin	557	3,093	3,650	3.3%
Pygmy killer whale	0	185	185	0.5%
False killer whale	0	279	279	0.7%
Killer whale	0	76	76	0.2%
Short-finned pilot whale	0	1,500	1,500	0.3%
Long-finned pilot whale	0	116	116	0.1%
Burmeister's porpoise	722	4,309	5,031	Unknown
Juan Fernandez fur seal	0	150	150	0.5%
South American fur seal	998	5,760	6,758	2.7%
South American sea lion	10,445	59,580	70,025	17.6%
Southern elephant seal	0	160	160	0.04%

[1] The Level A estimates are overestimates of predicted impacts to marine mammals as the estimates do not take into consideration the required mitigation measures for shutdowns or

power downs if a marine mammal is likely to enter the 180 or 190 dB exclusion zone while the airguns are active.

[2] Authorized Level A and B takes (used by NMFS as proxy for number of individuals exposed) expressed as the percent of the population listed in Table 1 in this notice. Unknown = Abundance size not available.

Lamont-Doherty did not estimate any additional take from sound sources other than airguns. NMFS does not expect the sound levels produced by the echosounder and sub-bottom profiler to exceed the sound levels produced by the airguns. During the estimated 10 nm of transit that is expected to occur between the three planned survey locations, the use of the MBES and SBP may occur independent of seismic airgun operation. This use of the MBES and SBP in the absence of airgun use was not explicitly described in the **Federal Register** notice for the proposed IHA (81 FR 23117; April 19, 2016). While sound from MBES and SBP has the potential to result in harassment of marine mammals, any potential for takes that could occur as a result of the MBES and SBP within those 10 nm of transit, which would equate to a total of approximately two hours of transit time based on a vessel speed of approximately 4.5 kt (5.1 mph), would be de minimis, based on the fact that the use of these sources may occur for only a portion of the 10 nm of transit, resulting in a relatively brief amount of time that these sources would potentially be operating in the absence of airgun operation. Additionally, as the take estimate methodology (see **Estimated Take by Incidental Harassment**) includes a 25 percent contingency for equipment failures, resurveys, or other operational needs, any takes that could potentially occur as a result of the MBES and SBP use in the absence of airgun operations would be accounted for in this 25 percent contingency.

As described above, NMFS considers the probability for entanglement of marine mammals to be so low as to be discountable, because of the vessel speed and the monitoring

efforts onboard the survey vessel. Therefore, NMFS does not authorize additional takes for entanglement.

As described above, the *Langseth* will operate at a relatively slow speed (typically 4.6 knots [8.5 km/h; 5.3 mph]) when conducting the survey. Protected species observers would monitor for marine mammals, which would trigger mitigation measures, including vessel avoidance where safe. Therefore, NMFS does not anticipate nor do we authorize takes of marine mammals as a result of vessel strike.

There is no evidence that the planned survey activities could result in serious injury or mortality within the specified geographic area for the requested Authorization. The required mitigation and monitoring measures would minimize any potential risk for serious injury or mortality.

Analysis and Determinations

Negligible Impact

Negligible impact is "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival" (50 CFR 216.103). The lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population level effects) forms the basis of a negligible impact finding. Thus, an estimate of the number of takes, alone, is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals that might be "taken" through behavioral harassment, NMFS must consider other factors, such as the likely nature of any responses (their intensity, duration, etc.), the context of any responses (critical reproductive time or location,

migration, etc.), as well as the number and nature of estimated Level A harassment takes, the number of estimated mortalities, effects on habitat, and the status of the species.

In making a negligible impact determination, NMFS considers:

- The number of anticipated injuries, serious injuries, or mortalities;
- The number, nature, and intensity, and duration of harassment; and
- The context in which the takes occur (*e.g.*, impacts to times or areas of significance);
- The status of stock or species of marine mammals (*i.e.*, depleted, not depleted, decreasing, increasing, stable, impact relative to the size of the population);
- Impacts on habitat affecting rates of recruitment/survival; and
- The effectiveness of monitoring and mitigation measures to reduce the number or severity of incidental takes.

To avoid repetition, our analysis applies to all the species listed in Table 7, given that NMFS expects the anticipated effects of the seismic airguns to be similar in nature. Where there are meaningful differences between species or stocks, or groups of species, in anticipated individual responses to activities, impact of expected take on the population due to differences in population status, or impacts on habitat, NMFS has identified species-specific factors to inform the analysis.

Given the required mitigation and related monitoring, NMFS does not anticipate that serious injury or mortality would occur as a result of Lamont-Doherty's seismic survey in the southeast Pacific Ocean. Thus NMFS does not authorize any mortality. NMFS's predicted estimates for Level A harassment take for some species are likely overestimates of the injury that will occur, as NMFS expects that successful implementation of the mitigation measures would

avoid Level A take in some instances. Also, NMFS expects that some individuals would avoid the source at levels expected to result in injury, given sufficient notice of the *Langseth's* approach due to the vessel's relatively low speed when conducting seismic surveys. Though NMFS expects that Level A harassment is unlikely to occur at the numbers authorized, is difficult to quantify the degree to which the mitigation and avoidance will reduce the number of animals that might incur PTS, therefore we authorize, include in our analyses, the modeled number of Level A takes, which does not take the mitigation or avoidance into consideration. However, because of the constant movement of the *Langseth* and of the animals, as well as the fact that the vessel is not expected to remain in any one area in which individuals would be expected to concentrate for any extended amount of time (*i.e*., since the duration of exposure to loud sounds will be relatively short), we anticipate that any PTS that may be incurred in marine mammals would be in the form of only a small degree of permanent threshold shift, and not total deafness, that would not be likely to affect the fitness of any individuals.

Of the marine mammal species under our jurisdiction that are known to occur or likely to occur in the study area, the following species are listed as endangered under the ESA: blue, fin, humpback, sei, Southern right, and sperm whales. The other marine mammal species that may be taken by harassment during Lamont-Doherty's seismic survey program are not listed as threatened or endangered under the ESA.

Cetaceans. Odontocete reactions to seismic energy pulses are usually thought to be limited to shorter distances from the airgun(s) than are those of mysticetes, in part because odontocete low-frequency hearing is assumed to be less sensitive to the low frequency signals of these airguns than that of mysticetes. NMFS generally expects cetaceans to move away from a noise source that is annoying prior to its becoming potentially injurious, and this expectation is

expected to hold true in the case of the planned activities, especially given the relatively slow travel speed of the *Langseth* while seismic surveys are being conducted (4.5 kt; 5.1 mph). The relatively slow ship speed is expected to provide cetaceans with sufficient notice of the oncoming vessel and thus sufficient opportunity to avoid the seismic sound source before it reaches a level that would be potentially injurious to the animal. However, as described above, Level A takes for a small group of cetacean species are authorized.

Potential impacts to marine mammal habitat were discussed previously in this document (see the "Anticipated Effects on Habitat" section). Although some disturbance is possible to food sources of marine mammals, the impacts are anticipated to be minor enough as to not affect the feeding success of any individuals long-term. Regarding direct effects on cetacean feeding, based on the fact that the action footprint does not include any areas recognized specifically for higher value feeding habitat, the mobile and ephemeral nature of most prey sources, and the size of the southeast Pacific Ocean where feeding by marine mammals occurs versus the localized area of the marine survey activities, any missed feeding opportunities in the direct project area are expected to be minor based on the fact that other equally valuable feeding opportunities likely exist nearby.

Taking into account the planned mitigation measures, effects on cetaceans are generally expected to be restricted to avoidance of a limited area around the survey operation and short-term changes in behavior, falling within the MMPA definition of "Level B harassment." Animals are not expected to permanently abandon any area that is surveyed, and based on the best available information, any behaviors that are interrupted during the activity are expected to resume once the activity ceases. For example, as described above, gray whales have continued to migrate annually along the west coast of North America with substantial increases in the

population over recent years, despite intermittent seismic exploration in that area for decades (Appendix A in Malme *et al*., 1984; Richardson *et al*., 1995; Allen and Angliss, 2014). Similarly, bowhead whales have continued to travel to the eastern Beaufort Sea each summer, and their numbers have increased notably, despite seismic exploration in their summer and autumn range for many years (Richardson *et al*., 1987; Allen and Angliss, 2014). The history of coexistence between seismic surveys and baleen whales suggests that brief exposures to sound pulses from any single seismic survey are unlikely to result in prolonged effects. Only a small portion of marine mammal habitat will be affected at any time, and other areas within the southeast Pacific Ocean would be available for necessary biological functions. Overall, the consequences of behavioral modification are not expected to affect cetacean growth, survival, and/or reproduction, and therefore are not expected to be biologically significant.

Pinnipeds. Generally speaking, pinnipeds may react to a sound source in a number of ways depending on their experience with the sound source and what activity they are engaged in at the time of the exposure, with behavioral responses to sound ranging from a mild orienting response, or a shifting of attention, to flight and panic. However, research and monitoring observations from activities similar to those planned have shown that pinnipeds in the water are generally tolerant of anthropogenic noise and activity. Visual monitoring from seismic vessels has shown only slight (if any) avoidance of airguns by pinnipeds and only slight (if any) changes in behavior (Harris *et al*., 2001; Moulton and Lawson, 2002). During foraging trips, extralimital pinnipeds may not react at all to the sound from the survey or may alert, ignore the stimulus, change their behavior, or avoid the immediate area by swimming away or diving. Behavioral effects to sound are generally more likely to occur at higher received levels (i.e., within a few kilometers of a sound source). However, the slow speed of the *Langseth* while conducting

seismic surveys (approximately 4.5 kt; 5.1 mph) is expected to provide ample opportunity for pinnipeds to avoid and keep some distance between themselves and the loudest sources of sound associated with the planned activities. Additionally, underwater sound from the planned survey would not be audible at pinniped haulouts or rookeries, therefore the consequences of behavioral responses in these areas are expected to be minimal. Overall, the consequences of behavioral modification are not expected to affect pinniped growth, survival, and/or reproduction, and therefore are not expected to be biologically significant.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel cycle (*i.e.*, 24 hour cycle). Behavioral reactions to noise exposure (such as disruption of critical life functions, displacement, or avoidance of important habitat) are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall *et al.*, 2007). While NMFS anticipates that the seismic operations would occur on consecutive days, the estimated duration of the survey would last no more than 75 days but would increase sound levels in the marine environment in a relatively small area surrounding the vessel (compared to the range of most of the marine mammals within the survey area), which is constantly travelling over distances, and some animals may only be exposed to and harassed by sound for less than a day.

For reasons stated previously in this document and based on the following factors, Lamont-Doherty's planned activities are not likely to cause long-term behavioral disturbance, serious injury, or death, or other effects that would be expected to adversely affect reproduction or survival of any individuals. They include:

- The anticipated impacts of Lamont-Doherty's survey activities on marine mammals are temporary behavioral changes due, primarily, to avoidance of the area around the seismic vessel;
- The likelihood that, given the constant movement of boat and animals and the nature of the survey design (not concentrated in areas of high marine mammal concentration), any PTS that is incurred would be of a low level;
- The availability of alternate areas of similar habitat value for marine mammals to temporarily vacate the survey area during the operation of the airgun(s) to avoid acoustic harassment;
- The expectation that the seismic survey would have no more than a temporary and minimal adverse effect on any fish or invertebrate species that serve as prey species for marine mammals, and therefore consider the potential impacts to marine mammal habitat minimal.

Tables 4 – 7 in this document describe the number of Level A and Level B harassment takes that we anticipate as a result of the planned survey activities outside Chile's territorial sea (12 nm). Lamont-Doherty would conduct the planned seismic survey within the EEZ and territorial waters of Chile. The planned survey would occur primarily on the high seas, with a small portion occurring within Chile's territorial sea. As described above, NMFS does not have authority to authorize the incidental take of marine mammals in the territorial seas of foreign nations, because the MMPA does not apply in those waters. However, as part of the analysis supporting our determination under the MMPA that the activity would have a negligible impact on the affected species, we must consider the incidental take expected to occur as a result of the activity in the entire activity area, including both territorial seas and high seas.

Based on NMFS's analysis, the area within the planned northern survey predicted to be ensonified to the Level B harassment threshold (160 dB re: 1 µPa) within Chilean territorial seas accounts for approximately 19 percent of the total area (including high seas and Chilean territorial seas combined) predicted to be ensonified to the Level B harassment threshold; for the planned central survey, the area predicted to be ensonified to the Level B harassment threshold within territorial seas accounts for approximately three percent of the total area predicted to be ensonified to the Level B harassment threshold in that entire survey area; and for the planned southern survey, the area predicted to be ensonified to the Level B harassment threshold within territorial seas accounts for approximately 24 percent of the total area predicted to be ensonified to the Level B harassment threshold in that entire survey area (Table 8).

We expect the impacts of Lamont-Doherty's survey activities, including the impacts of takes that are expected to occur within the territorial sea, to include temporary behavioral changes due, primarily, to avoidance of the area around the seismic vessel, with the potential for a small degree of PTS in a limited number of animals. Effects on marine mammals are generally expected to be restricted to avoidance of a limited area around the survey operation and short-term changes in behavior, falling within the MMPA definition of "Level B harassment." The slow speed of the *Langseth* while conducting seismic surveys (approximately 4.5 kt; 5.1 mph) is expected to provide ample opportunity for pinnipeds and cetaceans to avoid and keep some distance between themselves and the loudest sources of sound associated with the planned activities, both within and outside the territorial sea. Additionally, underwater sound from the planned survey, including the portions of the survey planned within the territorial sea, would not be audible at pinniped haulouts or rookeries, therefore the consequences of behavioral responses in these areas are expected to be minimal. Overall, taking into account the takes expected to

occur within the territorial sea as well as those expected to occur outside the territorial sea that NMFS authorizes, the consequences of behavioral modification are not expected to affect growth, survival, and/or reproduction of cetaceans or pinnipeds, and therefore are not expected to be biologically significant.

Marine mammals are not expected to permanently abandon any area that is surveyed, including areas within territorial seas, and based on the best available information, any behaviors that are interrupted during the activity are expected to resume once the activity ceases. Although some disturbance is possible to food sources of marine mammals within territorial seas, the impacts to those marine mammals are anticipated to be minor enough as to not affect the feeding success of any individuals long-term. Any missed feeding opportunities in the project area within territorial seas are expected to be minor based on the fact that other equally valuable feeding opportunities likely exist nearby. The portions of the seismic surveys that will occur within territorial seas would have no more than a temporary and minimal adverse effect on any fish or invertebrate species that serve as prey species for marine mammals, and therefore we believe the potential impacts to marine mammal habitat will be minimal.

As is the case for surveys outside territorial seas as described above, due to constant movement of the *Langseth* and of the animals, as well as the fact that the vessel is not expected to remain in any one area in which individuals would be expected to concentrate for any extended amount of time (*i.e.*, since the duration of exposure to loud sounds will be relatively short), we anticipate that any PTS that may be incurred in marine mammals within the territorial sea would be in the form of only a small degree of permanent threshold shift, and not total deafness, that would not be likely to affect the fitness of any individuals. There is no evidence that the planned survey activities, either outside or within the territorial sea, could result in

serious injury or mortality of marine mammals, and as described above NMFS expects that individuals would avoid the source at levels expected to result in injury, given sufficient notice of the *Langseth's* approach due to the vessel's relatively low speed when conducting seismic surveys.

For the reasons described above, the takes that would occur within the territorial sea, while not authorized by NMFS,do not alter our determinations above with respect to the relative likelihood of the activity to cause long-term behavioral disturbance, serious injury, or death, or other effects that would be expected to adversely affect reproduction or survival of any individual marine mammals.

Table 8. Areas predicted to be ensonified to Level B harassment threshold inside and outside Chilean territorial seas, and percent increase in ensonified area predicted in territorial seas versus ensonified area predicted outside territorial seas.

Planned survey location	Total area ensonified to Level B harassment threshold (160 dB re: 1 µPa)	Area ensonified to Level B harassment threshold (160 dB re: 1 µPa) outside territorial seas (percentage of total ensonified area in survey location)	Area ensonified to Level B harassment threshold (160 dB re: 1 µPa) inside territorial seas (percentage of total ensonified area in survey location)	Percent increase in ensonified area when territorial sea is included in survey area
Northern	61,295 km^2	49,645 km^2 (81%)	11,650 km^2 (19%)	23%
Central	10,593 km^2	10,315 km^2 (97.4%)	278 km^2 (2.6%)	3%
Southern	76,449 km^2	58,117 km^2 (76%)	18,332 km^2 (24%)	32%

Required mitigation measures, such as special shutdowns for large whales, vessel speed, course alteration, and visual monitoring would be implemented to help reduce impacts to marine mammals. Based on the analysis herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the monitoring and mitigation measures, NMFS finds that Lamont-Doherty's planned seismic survey would have a negligible impact on the affected marine mammal species or stocks.

Small Numbers

As described previously, NMFS estimates that Lamont-Doherty's activities could potentially affect, by Level B harassment, 44 species of marine mammals under our jurisdiction. NMFS estimates that Lamont-Doherty's activities could potentially affect, by Level A harassment, up to 26 species of marine mammals under our jurisdiction.

For each species, the numbers of take authorized are small relative to the population sizes: less than 18 percent for South American sea lion, less than 15 percent for the dusky dolphin, less than 11.5 percent for Chilean dolphin, and less than 5 percent for all other species (Table 7). As described above, NMFS cannot authorize the incidental take of marine mammals in the territorial seas of foreign nations, but must consider the level of incidental take as a result of the activity in the entire activity area (including both territorial seas and high seas) as part of the analysis supporting our determination under the MMPA that the activity would have a negligible impact on the affected species. We assume for the purposes of our analysis that the take predicted to occur within the Chilean territorial sea will account for approximately a 23 percent increase in the northern survey area; a 3 percent increase in the central survey area; and a 32 percent increase in the southern survey area, compared to the total number of incidental takes predicted to occur outside of the Chilean territorial sea (Table 7 and Table 8). Accounting for

these additional takes, the total takes predicted to result from the planned survey (including both the takes authorized by NMFS and the takes not authorized by NMFS but predicted to occur within the Chilean territorial sea) are still small relative to the population sizes, with no more than 22 percent taken for any marine mammal species.

NMFS is not aware of reliable abundance estimates for four species of marine mammals (Burmeister's porpoise, Peale's dolphin, pygmy right whale, and southern right whale dolphin) for which incidental take is authorized. Therefore we rely on the best available information on these species to make determinations as to whether the authorized take numbers represent small numbers of the total populations of these species.

The Burmeister's porpoise is distributed from the Atlantic Ocean in southern Brazil to the Pacific Ocean in northern Peru (Reyes 2009). While there are no quantitative data on abundance, the best available information suggest the species is assumed to be numerous throughout South American coastal waters (Brownell Jr. and Clapham 1999), with groups estimated at approximately 150 individuals observed off of Peru (Van Waerebeek *et al.* 2002). In addition the species is typically found shoreward of the 60 m isobath (Hammond *et al.* 2012), suggesting that the number of authorized takes is likely conservative as the species is unlikely to be encountered throughout the full survey area. The species' wide distribution and apparent abundance suggest the number of authorized takes represents a small number of individuals relative to the species' total abundance.

Peale's dolphin is a coastal species that is known to inhabit waters very near to shore, commonly within or shoreward of kelp beds, while in the waters of southern Chile and Tierra del Fuego they appear to prefer channels, fjords and deep bays (Goodall 2009). Their apparent habitat preference for waters very near to shore suggests that the number of authorized takes is

likely very conservative as the species is unlikely to be encountered throughout much of the survey area. While no abundance estimate exists for the species, Peale's dolphin is reportedly the most common cetacean found around the coast of the Falkland Islands and Chile *(Brownell Jr. et al.* 1999). The combination of the species' apparent abundance and the species' apparent preference for habitats that would not be surveyed by Lamont-Doherty suggests the number of authorized takes represents a small number of individuals relative to the species' total abundance.

The full distribution of the southern right whale dolphin is not known, but the species appears to be circumpolar and fairly common throughout its range. Survey data and stranding and fishery interaction data in northern Chile suggest that the species may be one of the most common cetaceans in the region (Van Waerebeek et al. 1991). The species' apparent abundance and its broad distribution suggest the number of authorized takes represents a small number of individuals relative to the species' total abundance.

The pygmy right whale has a circumpolar distribution, between about 30° and 55°S, with records from southern South America as well as Africa, Australia and New Zealand (Kemper 2009). There are no estimates of abundance for the species, but judging by the number of strandings in Australia and New Zealand, it is likely to be reasonably common in that region (Kemper 2009), with aggregations of up to approximately 80 individuals reported (Matsuoka 1996). The species' apparent abundance and its broad distribution suggest the number of authorized takes would represent a small number of individuals relative to the species' total abundance.

NMFS finds that the incidental take associated with Lamont-Doherty's planned seismic survey would be limited to small numbers relative to the affected species or stocks.

Impact on Availability of Affected Species or Stock for Taking for Subsistence Uses

There are no relevant subsistence uses of marine mammals implicated by this action.

Endangered Species Act (ESA)

There are six marine mammal species listed as endangered under the Endangered Species Act that may occur in the survey area. Under section 7 of the ESA, NSF initiated formal consultation with the NMFS Office of Protected Resources (OPR) Endangered Species Act Interagency Cooperation Division on the planned seismic survey. We (the NMFS Office of Protected Resources, Permits and Conservation Division) also consulted internally under section 7 of the ESA with the NMFS OPR Endangered Species Act Interagency Cooperation Division on the issuance of an Authorization under section 101(a)(5)(D) of the MMPA.

In July, 2016, the NMFS OPR Endangered Species Act Interagency Cooperation Division issued a Biological Opinion with an Incidental Take Statement to us and to the NSF, which concluded that the issuance of the Authorization and the conduct of the seismic survey were not likely to jeopardize the continued existence of blue, fin, humpback, sei, Southern right and sperm whales. The Biological Opinion also concluded that the issuance of the Authorization and the conduct of the seismic survey would not affect designated critical habitat for these species.

National Environmental Policy Act (NEPA)

NSF prepared an environmental analysis titled, "*Environmental Analysis of a Marine Geophysical Survey by the R/V Marcus G. Langseth in the Southeast Pacific Ocean, 2016/2017"*. NMFS independently evaluated the environmental analysis and prepared an Environmental Assessment (EA) titled, "*Proposed Issuance of an Incidental Harassment Authorization to Lamont-Doherty Earth Observatory to Take Marine Mammals by Harassment Incidental to a*

Marine Geophysical Survey in the Southeast Pacific Ocean, 2016/2017". NMFS and NSF provided relevant environmental information to the public through the **Federal Register** notice for the proposed IHA (81 FR 23117; April 19, 2016) and considered public comments received prior to finalizing our EA and deciding whether or not to issue a Finding of No Significant Impact (FONSI). NMFS concluded that issuance of an IHA to Lamont-Doherty would not significantly affect the quality of the human environment and prepared and issued a FONSI in accordance with NEPA and NOAA Administrative Order 216-6. NMFS's EA and FONSI for this activity are available on our web site at: *http://www.nmfs.noaa.gov/pr/permits/incidental*.

Authorization

NMFS has issued an Authorization to Lamont-Doherty for the potential harassment of small numbers of 44 marine mammal species incidental to conducting a seismic survey in the Southeast Pacific Ocean, between August 1, 2016 and July 31, 2017, provided the previously mentioned mitigation, monitoring and reporting measures.

Dated: August 8, 2016.

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Donna Wieting,

Director, Office of Protected Resources,

National Marine Fisheries Service.

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